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Original Article

Clinical and Functional Outcome Following Platelet Rich Plasma in Management of Knee-Osteo Arthritis

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ABSTRACT

Introduction: *Knee osteoarthritis (KOA) is a leading cause of chronic disability globally, with a rising prevalence due to aging populations, sedentary lifestyles, and obesity. Platelet-rich plasma (PRP) therapy has emerged as a promising treatment modality, offering both symptomatic relief and regenerative potential. This study evaluates the clinical and functional outcomes of PRP therapy in managing mild-to-moderate KOA in Bangladesh.* ***Methods & Materials:*** *A prospective study was conducted at the Department of Orthopedics, Combined Military Hospital, Savar, Bangladesh, over a 6-month period. Thirty participants with mild-to-moderate KOA were included based on clinical and radiological assessments. PRP was prepared from autologous blood using standardized protocols and administered intra-articularly at predefined intervals. Outcomes were assessed using the Visual Analog Scale (VAS) for pain, the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) for functional disability, and the Knee Injury and Osteoarthritis Outcome Score (KOOS) for joint function. Patient satisfaction was also recorded.* ***Results:*** *Statistically significant improvements were observed across all outcome measures. The VAS pain score decreased by 57.3%, the WOMAC total score improved by 46.1%, and the KOOS function score increased by 62.0% over the study period. Additionally, 76.7% of participants reported satisfaction with the treatment outcomes, while only 3.3% expressed dissatisfaction.* ***Conclusion:*** *PRP therapy demonstrated significant efficacy in reducing pain, improving function, and enhancing patient satisfaction in mild-to-moderate KOA. These findings highlight the potential of PRP as a cost-effective, minimally invasive alternative to conventional therapies and surgical interventions, particularly in resource-constrained settings. Further research is warranted to optimize protocols and evaluate long-term outcomes.*

Keywords: *Platelet-Rich Plasma, Knee Osteoarthritis, Pain Management, Functional Outcomes, PRP Therapy, Minimally Invasive Treatment, Bangladesh, VAS, WOMAC, KOOS*

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INTRODUCTION

Knee osteoarthritis (KOA) is a chronic and degenerative joint disease that significantly contributes to global morbidity and disability, particularly among older adults. Worldwide, the prevalence of KOA is rapidly increasing, driven by aging populations, sedentary lifestyles, and rising obesity rates [1]. It is estimated that KOA affects over 250 million people globally, imposing substantial socioeconomic and health burdens [2]. In Bangladesh, the burden of KOA is particularly acute in both rural and urban populations, with a higher prevalence observed among women and individuals in lower socioeconomic strata [3]. These populations face additional challenges due to limited access to healthcare and a lack of cost-effective treatment options, further exacerbating the impact of the disease. KOA is characterized by progressive degeneration of articular cartilage, synovial inflammation, subchondral bone remodeling, and osteophyte formation, leading to pain, stiffness, and functional limitations [4]. The condition predominantly affects weight-bearing joints, particularly the knees, causing chronic disability and impairing quality of life [5]. The pathology of KOA underscores the importance of both symptomatic relief and addressing structural degeneration, as untreated progression can lead to advanced stages of joint dysfunction requiring invasive surgical interventions such as total knee arthroplasty (TKA) [6]. Current treatment modalities for KOA are primarily focused on symptom management rather than halting or reversing disease progression. Non-surgical interventions, including nonsteroidal anti-inflammatory drugs (NSAIDs), corticosteroids, and hyaluronic acid (HA) injections, are commonly utilized. While these therapies provide temporary pain relief, their long-term effectiveness is limited, and they are often associated with adverse effects such as gastrointestinal and cardiovascular complications [5,7]. Physiotherapy and weight management remain essential components of KOA management, but adherence challenges and accessibility issues often reduce their efficacy [8]. For advanced cases, TKA remains the gold standard, but its high costs, prolonged recovery periods, and potential complications make it inaccessible for many patients in resource-constrained settings like Bangladesh [3]. Platelet-rich plasma (PRP) has emerged as a promising minimally invasive treatment for KOA, offering both symptomatic relief and potential regenerative benefits. PRP is derived from

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autologous blood and contains a concentrated mixture of platelets and growth factors, such as platelet-derived growth factor (PDGF) and transforming growth factor-beta (TGF-β), which are critical for tissue repair and anti-inflammatory effects [9]. By modulating the inflammatory environment and promoting cartilage regeneration, PRP addresses both the symptomatic and structural aspects of KOA [10]. Clinical studies have demonstrated significant improvements in pain scores, such as the Visual Analogue Scale (VAS), and functional outcomes measured by the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) and Knee injury and Osteoarthritis Outcome Score (KOOS), particularly in patients with mild to moderate KOA [11,12]. Additionally, PRP has been shown to outperform HA in both short- and long-term outcomes, offering superior pain relief and functional improvement [12]. In Bangladesh, the relevance of PRP is particularly notable due to its autologous nature, outpatient feasibility, and cost-effectiveness compared to surgical interventions [13]. Studies conducted in the region have highlighted the potential of PRP to address the unmet need for effective and accessible treatments for KOA, especially in elderly populations who have failed to respond to conventional therapies [12]. However, despite its promising results, variability in PRP preparation methods and patient selection criteria continues to pose challenges, necessitating further research to optimize its application [14]. This study aims to evaluate the clinical and functional outcomes of PRP in the management of KOA in Bangladesh. By focusing on a population with unique genetic, cultural, and healthcare challenges, the research seeks to provide critical insights into the applicability and effectiveness of PRP in resource-limited settings. Such findings have the potential to advance treatment paradigms for KOA, contributing to improved quality of life for affected individuals and reducing the socioeconomic burden of the disease.

METHODS & MATERIALS

This prospective study was conducted at the Department of Orthopedics, Combined Military Hospital (CMH), Savar, Bangladesh, from January 2024 to June 2024, following ethical approval from the hospital's Ethical Review Committee. A total of 30 patients with mild-to-moderate knee osteoarthritis (KOA) were included. Patients were selected based on clinical and radiological assessments, while those with advanced KOA, prior knee surgeries, systemic inflammatory diseases, or contraindications to platelet-rich plasma (PRP) therapy were excluded. PRP was prepared from autologous blood using standardized protocols to ensure the appropriate concentration of platelets and growth factors. Patients received intra-articular PRP injections at predefined intervals during the study period. Outcomes were assessed using validated tools, including the Visual Analog Scale (VAS) for pain, the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) for functional disability, and the Knee Injury and Osteoarthritis Outcome Score (KOOS) for overall joint function. Data were collected at baseline and at regular follow-up intervals (1-, 3-, and 6-months post-intervention). Statistical analysis was performed to evaluate changes in pain, function, and patient outcomes over time. Ethical standards were maintained, and all participants provided informed consent before enrollment.

RESULTS

Table – I: Distribution of demographic characteristics among participants (*n*=30)

Variable	Mean ± SD/N (%)
Age (years)	56.8 ± 8.2
Female	18 (60%)
Male	12 (40%)
BMI (kg/m^2)	29.4 ± 3.1
Urban population	22 (73%)
Rural population	8 (27%)

The demographic characteristics of the study participants are summarized in Table 1. The mean age of the participants was 56.8 ± 8.2 years, with the majority being female (60%, n = 18) compared to males (40%, n = 12). The average BMI of the participants was 29.4 ± 3.1 kg/m^2, indicating a predominantly overweight population. In terms of geographic distribution, a larger proportion of participants belonged to urban areas (73%, n = 22) compared to rural areas (27%, n = 8).

Table – II: Distribution of outcome measures among participants (*n*=30)

Outcome Measure	Baseline	3 Months	6 Months	% Improvement (6 months)
VAS Pain Score	7.5 ± 1.2	4.8 ± 1.5	3.2 ± 1.3	57.30%
WOMAC Total Score	52.1 ± 8.7	34.5 ± 6.9	28.1 ± 5.8	46.10%
KOOS Function Score	42.3 ± 9.2	58.4 ± 7.5	68.5 ± 6.3	62.00%

The outcome measures observed among participants are presented in Table 2. At baseline, the mean Visual Analog Scale (VAS) pain score was 7.5 ± 1.2, which significantly improved to 4.8 ± 1.5 at 3 months and further reduced to 3.2 ± 1.3 at 6 months, representing a 57.3% improvement over the study period. Similarly, the mean WOMAC total score, which was 52.1 ± 8.7 at baseline, decreased to 34.5 ± 6.9 at 3 months and 28.1 ± 5.8 at 6 months, reflecting a 46.1% improvement in overall functional disability. In terms of joint function, the mean KOOS function score increased from 42.3 ± 9.2 at baseline to 58.4 ± 7.5 at 3 months and 68.5 ± 6.3 at 6 months, showing a substantial 62.0% improvement.

Table – III: Distribution of satisfaction level among the participants (*n*=30)

Satisfaction Level	N (%)
Satisfied	23 (76.7%)
Partially Satisfied	6 (20%)
Not Satisfied	1 (3.3%)

The satisfaction levels of the participants following PRP therapy are shown in Table 3. The majority of the participants reported being satisfied with the treatment (76.7%, n = 23), while 20% (n = 6) expressed being partially satisfied. Only 3.3% (n = 1) of the participants reported being not satisfied with the outcomes.

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DISCUSSION

The findings of this study demonstrate that platelet-rich plasma (PRP) therapy significantly improves pain, functional disability, and joint function in patients with mild-to-moderate knee osteoarthritis (KOA). Over a 6-month follow-up period, participants showed substantial reductions in pain (VAS score: 57.3% improvement), functional disability (WOMAC total score: 46.1% improvement), and enhanced joint functionality (KOOS function score: 62.0% improvement). These results align with previous studies that have established PRP as a minimally invasive treatment modality offering both symptomatic relief and regenerative benefits. For instance, Filardo et al. reported similar reductions in pain and functional disability following PRP therapy, which significantly outperformed traditional injectables such as corticosteroids and hyaluronic acid (HA) [15]. The statistically significant improvement in VAS scores observed in this study corroborates the findings of Bharath and Yadav, who highlighted superior pain reduction with PRP compared to corticosteroids over 6 months [16]. Furthermore, Tang et al. confirmed that PRP therapy is more effective than HA in relieving pain and improving function, supporting its suitability as a first-line injectable treatment for KOA [17]. The notable improvements in WOMAC and KOOS scores in our study are consistent with the findings of Martini et al., who demonstrated significant functional gains using PRP, particularly in early to moderate KOA cases [18]. The high satisfaction rates (76.7%) among participants in this study further underscore PRP's effectiveness and acceptability. This is consistent with the results of Wang et al., who reported a 78.6% satisfaction rate among patients treated with PRP, and Verron et al., who observed similarly high satisfaction levels with SATMED-Q© scores exceeding 80% [19,20]. The low dissatisfaction rate (3.3%) observed in our study suggests that PRP therapy is well-tolerated and meets patient expectations in terms of outcomes, making it an attractive option in clinical practice. The demographic characteristics of the participants in this study reflect trends commonly observed in KOA populations. The mean age of 56.8 years, female predominance (60%), and overweight BMI (29.4 kg/m^2) align with findings from studies such as Li et al., which highlight the disproportionate impact of KOA on middle-aged, overweight females [21]. The urban-dominant population (73%) observed in this study mirrors the results of Ahmad and Al-Jwary, who found a higher prevalence of KOA in urban areas, likely due to lifestyle factors such as reduced physical activity and higher obesity rates [22]. Despite its benefits, PRP therapy is not without limitations. Variability in preparation methods, including platelet concentration and the presence of leukocytes, has been shown to influence outcomes [14]. This variability underscores the need for standardized protocols to maximize therapeutic efficacy. Additionally, the long-term durability of PRP's regenerative effects remains uncertain. While the observed improvements were sustained over 6 months in our study, further research is needed to evaluate whether these benefits persist beyond this period. Importantly, the relevance of PRP therapy in resource-constrained settings like Bangladesh cannot be overstated. Its autologous nature and outpatient feasibility make it a cost-effective alternative to surgical interventions such as total knee arthroplasty (TKA), which is often inaccessible to many patients due to financial and logistical barriers [3]. The findings of Joarder et al. support the use of PRP in such settings, particularly for elderly patients unresponsive to traditional therapies [13]. In conclusion, this study confirms the efficacy and acceptability of PRP therapy for managing mild-to-moderate KOA, with significant improvements in pain, function, and patient satisfaction. The results are consistent with global evidence and highlight PRP as a promising treatment option, particularly in resource-limited healthcare settings. Further research should focus on optimizing preparation protocols and evaluating long-term outcomes to solidify PRP's role in KOA management.

Limitations of The Study

The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

CONCLUSION

This study confirms the effectiveness of platelet-rich plasma (PRP) therapy as a minimally invasive treatment for managing mild-to-moderate knee osteoarthritis (KOA). Over a 6-month period, PRP therapy resulted in statistically significant improvements in pain relief, functional disability, and joint function, as evidenced by reductions in VAS and WOMAC scores and increases in KOOS function scores. High levels of participant satisfaction further underscore its acceptability and potential as a viable treatment option. The findings were particularly relevant to an overweight, middle-aged, and urban-dominant population, highlighting the suitability of PRP therapy in similar demographic groups. PRP therapy offers a promising alternative to conventional therapies and surgical interventions, especially in resource-constrained settings like Bangladesh. However, further research is recommended to optimize PRP preparation techniques and evaluate long-term outcomes to establish its role as a standard treatment for KOA.

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